Apollo G&N Specifications
ND-1002019-D
TDRR NO. 01766
Class A Release
5 April 1963

MARKING,

GENERAL SPECIFICATION FOR

Record of Revisions

Revision Letter	TDRR No.	Pages Revised	Approvals		Date
			MIT	NASA	
A	02651	All	WJR	[illegible]	5/4/63
B	05961	2 and 3 only.	WJR	[illegible]	[illegible]
C	09940	2, 3, 4	WR	[illegible]	6/9/64
D	15276	1, 2, 3	WR	[illegible]	1/19/65

This specification consists of page i to iii and 1 to 5 inclusive.

APOLLO
G & N SPECIFICATION
ND 1002019-C
8 April 1963

MARKING,

GENERAL SPECIFICATION FOR

The purpose of this document is to establish the general marking requirements for the identification of parts and assemblies used in APOLLO Guidance and Navigation Equipment.

W. A. Kupfer 26 June 63
MIT INSTRUMENTATION LABORATORY

Joel Bennett 6/26/63
NASA/MSC APPROVAL

APOLLO
G & N SPECIFICATION
ND 1002019-C
8 April 1963

PREPARED BY	TITLE	DATE
[illegible]	ENGINEER	[illegible]
RAYTHEON COMPANY		

EXAMINED BY	TITLE	DATE
[illegible]	MANAGER OF DOCUMENTATION	17 May 63
RAYTHEON COMPANY		

APPROVED BY	TITLE	DATE
[illegible]	MIT	6/22/63
MIT/IL		

APPROVED BY	TITLE	DATE
MIT/IL		

APPROVED BY	TITLE	DATE
MIT/IL		

MARKING,

GENERAL SPECIFICATION FOR

1. SCOPE

1.1 This specification establishes the general marking requirements for parts and assemblies.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of invitation for bids form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

QQ-T-25	Tape, Electric Wire-Flexible Insulating Sleeving Marking Machine (Roll, Wire Identification Marking)

Military

MIL-V-173	Varnish, Moisture and Fungus - Resistant, for the Treatment of Communications Electronics and Associated Electrical Equipment
MIL-E-7729	Enamel, Gloss, Aircraft Application

Apollo GSN

[illegible]	Fabric Serialed Characters, Process Specification
[illegible]	NDI Screening, Process Specification

2.2 CONFLICTING REQUIREMENTS. In the event of conflict between the requirements of the applicable drawings, this specification, and other documents cited herein, resolution must be obtained from the MIT Apollo Management Office via the purchaser.

3. REQUIREMENTS

3.1 PREFERENCE. Marking by stamping, silk screening, or stencilling shall be preferred to engraving, electric etching or hand marking. However, all marking shall be suitable for the intended purpose, shall be legible, and shall be as permanent as the item being marked.

3.2 CHARACTERS. Letters shall be without serifs (sans-serifs) such as "Gothic" or "Futura" capitals, and the numerals shall be Arabic. Other characters and hand marking shall be of a similar appearance.

3.2.1 Style. Unless otherwise specified by the drawing, characters except for hand marking shall be Futura Demibold applied as specified by Specification ND 1002122.

3.2.2 Size. Unless otherwise specified, character size shall be proportional to the area available for marking. 1/12 through 1/4-inch characters shall be preferred.

3.3 LOCATION AND TEXT. Unless otherwise specified herein, the text and location of markings shall be as specified by the drawing or order.

3.4 PROCESS LIMITATIONS

3.4.1 Electric Etching. Electric etching shall be used only to mark inherently corrosion resistant metallic materials.

3.4.2 Engraving. Plated surfaces shall not be engraved or etched.

3.4.3 Encapsulation. Encapsulated surfaces shall be silk screened or stencilled.

3.5 PROTECTION OF FINISHED MARKINGS

3.5.1 Ink and Enamel Markings. Applied ink, except epoxy ink, and enamel markings shall be protected with one coat of commercial grade acrylic lacquer or one coat of varnish conforming to Type I of Specification MIL-V-173. A protective coating shall not be used when it will cause flaking of applied markings or have other deleterious effects on the marking or part.

3.5 CABLE AND HARNESS MARKING. Unless otherwise specified by the drawing or order, harness and cable marking shall consist of the harness or cable identification letter or wire list identification letter, as applicable, followed by the conductor number.

3.6.1 Form.

3.6.1.1 Style. Letters shall be without serifs (sans-serifs) such as "Gothic" or "Futura" capitals, and the numerals shall be Arabic. Other characters and hand marking shall be of similar appearance.

3.6.1.2 Height. Markings shall be not less than 3/64 inch in height.

3.6.2 Color. Markings shall be black except when black does not contrast with the surface being marked, in which case the marking color shall be white or yellow.

3.6.3 Location. Unless otherwise specified by the drawing or order, markings shall be located as follows:

3.6.3.1 Plastic Insulated Conductors. Individual plastic insulated conductors (see 6.1) shall be marked every 1.2 inches, ± 10%, center to center, or multiples thereof to a maximum of 3.6 inches ± 10%.

3.6.3.2 Sleeves.

3.6.3.2.1 Single and Multiple Conductor Wires. When single or multiple conductor wire cannot be marked directly due to size or configuration, an identification sleeve, of the type and size specified by the drawing, shall be affixed within 6 inches of each end except as specified in 3.6.4. The sleeve shall be marked with the identification and color code of each wire it encloses.

3.6.3.2.2 Cables and Shielded and Twisted Wire. Cables, multiple conductor shielded wire, and twisted wire in which individual conductors are color coded shall be marked as assemblies. The marking shall be on identification sleeves attached to the cable or wires within 6 inches of each end.

3.6.4 Wires Not Requiring Marking. Unless otherwise specified by the drawing or order, the following wires shall not be marked:

a. Shield grounds less than 6 inches long
b. Short wires 3 inches or less in length
c. Individual color coded wires
d. Wire used in wire wrap assemblies

3.6.5 Marking Method. Unless otherwise specified on the drawing plastic sleeving and insulation shall be marked by hot impression stamping per 3.7.3.

3.7 TYPES OF MARKINGS. Unless specified by the drawing, the material being marked shall determine the type of marking.

3.7.1 Rubber Stamping, Stenciling, and Silk Screening. Rubber stamping, hand marking, stenciling, and/or silk screening shall be applied on plastic, ceramic, anodized, and other surfaces not suitable for impression stamping, electromechanical etching, or electro etching. Hand marking shall be limited to remarking, when original marking methods cannot feasibly be used. The markings shall be applied on clean or properly primed surfaces after final protective treatment. Markings shall be made with materials having a high degree of contrast and legibility. Temporary ink shall not be used on materials harmfully affected by the solvents used for removing the marking. The inks selected for either permanent or temporary markings shall not affect the function or serviceability of the part or assembly.

e. After marking tetrafluoroethylene, the material shall be sintered for approximately 1 to 2 seconds at 620° to 650°F.

3.7.4 Electrochemical Etching. Unless otherwise specified by the drawing, electrochemical etching shall be used for permanent marking of bare metallic or conductive surfaces in preference to rubber stamping, or where impression stamping is unsuitable. The etchings and the area around them shall be properly cleaned to prevent rust or corrosion.

3.7.5 Electroetching. When specified on the engineering drawing, the electroetch method may be used.

3.7.6 Nameplates. When nameplates are specified by the engineering drawing for marking units and complete assemblies, the markings on the nameplates shall be applied by one of the methods specified herein. Type-impression markings, applied either by hand or machine, shall be the preferred method.

3.7.7 Tagging and Bagging. Parts requiring tagging shall be tagged with a wrap-around strip of metal or other suitable material bearing the identification marking. The tag and wire material shall be compatible with the part material. Ferrous tag or wire material shall not be used with nonferrous parts, except brass or bronze. Aluminum tags or wire shall be used with aluminum and magnesium alloy parts.

3.7.7.1 Bagging. Parts that are too small, or otherwise unsuitable for other methods of identification, shall be identified by rubber stamping the bag, container, or envelope.

3.8 WORKMANSHIP. All markings shall be clearly legible and shall be applied in a manner that will insure that the markings do not adversely affect the structural quality, protective finish, or intended use of the part or surface.

4. QUALITY ASSURANCE PROVISIONS

4.1 INSPECTION. All markings shall be visually inspected for legibility, definition, neatness, uniformity and conformance to the requirements of this specification.

4.2 REJECTION. Failure to meet any of the requirements of this specification shall be cause for rejection of the part bearing the failed marking.

5. PREPARATION FOR DELIVERY. There are no applicable requirements.

6. NOTES

6.1 PLASTIC INSULATION. Plastic insulation includes at least nylon, irradiated polyethylene, vinyl, acrylics, cellulosics, and tetrafluoroethylene.

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1 April 1963

MARKING,

GENERAL SPECIFICATION FOR

Record of Revisions

Revision Letter	TDRR No.	Pages Revised	Approvals		Date
			MIT	NASA	
A	02651	All	WKR	[illegible]	5/4/63
B	05941	2 and 3 only.	WKR	[illegible]	28 4/64
C	09940	2, 3, 4	WR	[illegible]	6/9/64
D	15276	1, 2, 3	WR	[illegible]	1/19/65
E	22159	2 & 3	WR 10-26-65	L. C. METZGER	9/6/65

This specification consists of page i to iii and 1 to 5 inclusive.

MARKING,

GENERAL SPECIFICATION FOR

1. SCOPE

1.1 This specification establishes the general marking requirements for parts and assemblies.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of invitation for bids form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

QQ-T-[illegible]	Tape, Electric Wire-Flexible Insulating Sleeving Marking Machine (Pull, Wire Identification Marking)

Military

MIL-V-[illegible]	Varnish, Moisture and Fungus - Resistant, for the Treatment of Communications Electronics and Associated Electrical Equipment
MIL-E-[illegible]	Enamel, Glass, Aircraft Application

Apollo G&N

ND-[illegible]	Fabric Deadfold Characteristics, Process Specification
ND-[illegible]	[illegible] Screening, Process Specification
ND-[illegible]	Ink, Stamp Pad and Marking Pencil
ND-[illegible]	Ink, Marking
ND-[illegible]	Ink, Marking

2.2 [illegible] In the event of conflict between the requirements of the applicable drawings, this specification, and other documents cited herein, resolution must be obtained from the NDI Apollo Management Office via the purchaser.

3. REQUIREMENTS

3.1 PREFERENCE. Marking by stamping, silk screening, or stencilling shall be preferred to engraving, electric etching or hand marking. However, all marking shall be suitable for the intended purpose, shall be legible, and shall be as permanent as the item being marked.

3.2 CHARACTERS. Letters shall be without serifs (sans-serifs) such as "Gothic" or "Futura" capitals, and the numerals shall be Arabic. Other characters and hand marking shall be of a similar appearance.

3.2.1 Style. Unless otherwise specified by the drawing, characters except for hand marking shall be Futura Demibold applied as specified by Specification ND 1002122.

3.2.2 Size. Unless otherwise specified, character size shall be proportional to the area available for marking; 1/12 through 1/4-inch characters shall be preferred.

3.3 LOCATION AND TEXT. Unless otherwise specified herein, the text and location of markings shall be as specified by the drawing or order.

3.4 PROCESS LIMITATIONS

3.4.1 Electric Etching. Electric etching shall be used only to mark inherently corrosion resistant metallic materials.

3.4.2 Engraving. Plated surfaces shall not be engraved or etched.

3.4.3 Encapsulation. Encapsulated surfaces shall be silk screened or stencilled.

3.5 PROTECTION OF FINISHED MARKINGS

3.5.1 Ink and Enamel Markings. Applied ink, except epoxy ink, and enamel markings shall be protected with one coat of commercial grade acrylic lacquer or one coat of varnish conforming to Type I of Specification MIL-V-173. A protective coating shall not be used when it will cause flaking of applied markings or have other deleterious effects on the marking or part.

3.6 CABLE AND HARNESS MARKING. Unless otherwise specified by the drawing or order, harness and cable marking shall consist of the harness or cable identification letter or wire list identification letter, as applicable, followed by the conductor number.

3.6.1 Form.

3.6.1.1 Style. Letters shall be without serifs (sans-serifs) such as "Gothic" or "Futura" capitals, and the numerals shall be Arabic. Other characters and hand marking shall be of similar appearance.

3.6.3 Location. Unless otherwise specified by the drawing or order, markings shall be located as follows:

GENERAL SPECIFICATION FOR

[illegible]

[illegible] (Seal, Wire Identification, Marking)

[illegible] Associated Electrical Equipment

[illegible]

[illegible] for [illegible] for molding thermoplastics.

[illegible]

[illegible]

[illegible] seriously affect th[illegible]

[illegible]

MATERIAL	TEMPERATURE (°F)
Nylon and Polyethylene	400 to 450
[illegible]	350 to 375
Acrylics, Polystyrene and [illegible]	250 to 420
Tetrafluoroethylene	425±5

[illegible]

[illegible]

[illegible]

GENERAL SPECIFICATION FOR

Class [illegible]
[illegible]

MARKING

GENERAL SPECIFICATION FOR

RECOMMENDED PLATEN TEMPERATURES

4. QUALITY ASSURANCE PROVISIONS

3.4 Process Limitations

3.4.1 Electric Etching. Electric etching shall be used only to mark inherently corrosion resistant metallic materials.

3.4.2 Engraving. Plated surfaces shall not be engraved or etched.

3.4.3 Encapsulation. Encapsulated surfaces shall be silk screened or stenciled.

3.5 Protection of Finished Markings

3.5.1 Airborne Applications

3.5.1.1 Ink per SCD 1810920: overcoating per MIL-V-173 type I is required.

3.5.1.2 Ink per SCD's 1008871 and 1018545. No coating is required.

3.5.1.3 Other Inks (SCD's). The coatings shall be suitable for the purpose intended, shall not cause flaking of applied markings or have other deleterious effects on the markings or the part. An acrylic lacquer should not be used.

3.5.2 Ground Support Applications. The coating shall be suitable for the purpose intended.

3.6 Cable and Harness Marking. Unless otherwise specified by the drawing or order, harness and cable marking shall consist of the harness or cable identification letter or wire list identification letter, as applicable, followed by the conductor number.

3.6.1 Form

3.6.1.1 Style. Letters shall be without serifs (sans-serif) such as "Gothic" or "Future" capitals, and the numerals shall be Arabic. Other characters and hand marking shall be of similar appearance.

3.6.1.2 Height. Markings shall be not less than 3/64 inch in height.

3.6.2 Color. Markings shall be black except when black does not contrast with the surface being marked, in which case the marking color shall be white or yellow. In addition, green may be used for ground support equipment.

3.6.3 Location. Unless otherwise specified by the drawing or order, markings shall be located as follows:

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ND1002019 L
TDRR NO. 01766
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8 April 1963

MARKING,

GENERAL SPECIFICATION FOR

Record of Revisions

Revision Letter	TDRR No.	Pages Revised	Approvals		Date
			AC	NASA	
A	02651	All	WLR	[illegible]	5/9/63
B	05941	2 and 3 only.	WLR	[illegible]	[illegible]
C	09940	2, 3, 4	WLR	[illegible]	6/9/64
D	15276	1, 2, 3	WLR	[illegible]	1/19/65
E	21159	2 & 3	WLR [illegible]	A. C. METZGER	[illegible]
	25673	[illegible]	WLR	A. C. METZGER	1/26/66
G	29180	2	MGM	—	5/26/66
H	31781	3-6 was 6 pages now 8 pages	MGM EA	ACM	11/3/66
J	33152	3	MGM EA	ACM	3-2-67
K	35873	1, 4-9; was 8 pages, now 9 pages	MGM EA	---	3/13/68
L	37595	3, 4	MGM EA	[illegible]	5/19/69

This specification consists of page i to iii and 1 to 9 inclusive.

3.3.1 Flight Risk Hardware

a. Marking and Identification. Components or items which possess an established condition which significantly affects reliability and which should not be used for flight systems shall be marked conspicuously as defined and authorized by the applicable contract waiver or FNN.

b. Marking Location. This marking shall be accomplished adjacent to the part number for the assembly levels specified by the waiver or FNN.

c. Marking Application. Marking consists of a 1/4" diameter yellow dot utilizing ink which conforms to SCD 1006271-004.

3.3.2 Discrepant Hardware Not Required

a. Discrepant articles which are not scheduled for failure analysis and repair shall be marked with yellow characters 1/4" inch high. The word "Discrepant" shall be used to identify this type of hardware. The articles shall be further identified with a tag or label which references the discrepancy document which defines the condition which has not been repaired. If future requirements result in authorization to failure analyze and repair the hardware, the marking shall be removed upon completion of repair and successful retest.

b. Marking Location. Where feasible, location of marking shall be adjacent to the part number and readily visible from the assembled position. Those articles which cannot be marked due to size limitations shall be identified by tagging or bagging and marking the tag or bag.

c. Marking Application. Marking shall be accomplished utilizing ink which conforms to SCD 1006271-004 or SCD 1012545-005.

3.3.3 Qualification Test Hardware

a. Marking and Identification. When required by the test document, all articles having been exposed to a qualification test environment, shall be marked with yellow characters 1/4 inch high. The words "QUAL TEST" shall be used to identify this type of hardware.

b. Marking Location. Where feasible, location of marking shall be adjacent to the part number and readily visible from the assembled position. Those articles which cannot be marked due to size limitations shall be identified by tagging or bagging and marking the tag or bag.

c. Marking Application. Marking shall be accomplished utilizing ink which conforms to SCD1006271-004 or SCD1012545-005.

3.3.4 Evaluation Test Hardware

a. Marking and Identification. When required by the test document, all articles having undergone evaluation testing shall be marked with yellow characters 1/4 inch high. Articles assigned to such places as engineering labs where quality assurance surveillance will not be maintained may be marked upon assignment to the uncontrolled area or location. The words "EVAL TEST" shall be used to identify this type of hardware.

b. Marking Location. Where feasible, location of marking shall be adjacent to the part number and readily visible from the assembled position. Those articles which cannot be marked due to size limitations shall be identified by tagging or bagging and marking the tag or bag.

c. Marking Application. Marking shall be accomplished utilizing ink which conforms to SCD1000271-004 or SCD1012545-005.

3.3.5 Flight Hardware

a. All articles having been subjected to flight shall be marked with yellow characters 1/4 inch high. The word "flight" followed by the flight number shall be used to identify this type hardware.

b. Marking Location. Mark per 3.3.4.b.

c. Marking Application. Mark per 3.3.4.c above.

3.3.6 Test Articles

a. Functionally operational units of less than "Class A" status used as test articles or workhorse units shall be marked with yellow characters 1/4 inch high. The words "TEST ARTICLE" shall be used to identify this type of hardware.

b. Marking Location: Mark per 3.3.4.b.

c. Marking Application: Mark per 3.3.4.c.

3.3.7 Beryllium Warning Decals

a. A Beryllium Warning Decal, Part Number 2021263, shall be applied to the external parts and/or assemblies of all G&N Systems that contain beryllium. The decals shall be applied immediately after completion of the intended use of the system such as after flight, prototype evaluation, qualification testing, or evaluation of learners.

b. The decal shall be located in an area readily visible from the assembled position and shall be applied directly to the beryllium part or assembly. The following equipment shall be so identified:

Block I	Block II and LEM
CDU's	Optical Unit
CDU Frame Assembly	IMU Assembly
IMU Assembly	AOT
NAV BASE Frame Assembly	IMU and PIPA Assembly
Optical Unit	IMU and Pulse Torque Assembly
PSA Toe Cap	

c. The decal shall be bonded to the equipment in accordance with the requirements of Specification ND1002219, Method II, except that beryllium surfaces shall not be abraded. Application of the decal directly to a painted surface will be acceptable.